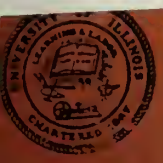

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ABSTRACT

Since 1978 there has been a significant increase in the number of high risk bond offerings. The shift to lower rated bonds introduces a substantive challenge to the rating agencies. The shift to low rated offerings was not observed in prior bond rating empirical studies. This study uses an n-chotomous multivariate probit model with cash based funds flow components and financial ratios to predict industrial bond ratings. New and reclassified bond ratings by Moody's in 1983 are used to predict 1984 ratings. Initially the classification and predictive results were slightly lower than previous studies. A careful analysis of the classification/prediction probability distributions showed the results were close to being correct in a large number of cases. A correct/close measure indicated the predictive accuracy of the models to be substantially higher than initially observed. The analysis found four funds flow components to be significant in predicting the bond ratings of reclassified issues. The significant components were inventories, dividends, financing and fixed coverage charges. Finally, the study highlights the complexity of the bond rating process.

PREDICTING INDUSTRIAL BOND RATINGS WITH A PROBIT MODEL AND FUND FLOW COMPONENTS[1]

After surveying the empirical literature Lev [26], Foster [15] and Altman, Avery, Eisenbeis and Sinkey [1] concluded that decision makers gained substantive insights from results that were generated by using accounting and financial information in multivariate models.[2] In synthesizng the literature the authors indicate that financial information based models are useful in predicting corporate failure, bond ratings and in classifying the credit riskiness of commercial bank loans.

In the next few paragraphs our objective is to present key insights and develop basic research issues that emerged from our review of the literature on predicting bond ratings. It was apparent that the accuracy of the previous models in classifying bond ratings for original sample data was relatively high, but the prediction results were markedly lower. Also we found most of the studies focused on predicting the ratings of new bond offerings. However, a few studies concentrated on the rating prediction of reclassified bond issues.

A critical finding was that the results of the prior studies were all data dependent. That is each study was based on a different time period and a unique set of ratios was used to predict bond ratings. Ang and Patel [4] recognized the data dependent issue that results in the inability to generalize the similarities and difference of the empirical findings.

Many of the empirical studies were based on the use of financial ratios in a multiple discriminant analysis model (MDA). The shortcomings encountered when using the MDA model with data that does not meet its normality assumptions has been widely discussed by Eisenbeis [12], Joy and Tollefson [23], Pinches [32, 33] and Altman, et al. [1].

In the model building/classification testing phase of many studies there was a relatively high classification error in one or more of the Moody rating categories of A, Baa, or Ba. Explaining the misclassification phenomenon was a common thread found in many of the studies. Why do the misclassifications occur mainly in the A, Baa and Ba ratings? In collecting the data we observed the researchers used a widely accepted procedure of subdividing the bonds into either an investment of a noninvestment grade. For most studies it appears the investment grade bonds were primarily nonconvertible, nonsubordinated fixed income securities and most of the noninvestment grade bonds were convertible, subordinated securities. We found there were very few nonsubordinated, nonconvertible bonds issued in the 1960s and 1970s. In trying to understand the misclassification phenomenon of prior studies, a methodology issue arises concerning the rating of convertible bonds vis-a-vis straight fixed income bonds. For a company with both fixed income and convertible debt outstanding, the convertible bonds are rated one class below straight fixed income debt because of their subordinated nature, Ritchie [43, p. 583]. Although there may be a convertible bond effect contributing to the misclassification phenomona in previous studies, we raise the issue in order to sharpen the measurement process used in this study.

In 1978 the new issues bond market experienced an increased acceptance of nonconvertible, noninvestment grade bonds, commonly referred to as high yield or junk bonds, Drexel Burnham Lambert [11], Fitzpatrick and Severiens [14], Grant [19]. Because of this substantive expansion of the junk bond market, which was not present in previous studies, important issues in this paper are to determine if nonconvertible high yield bonds have an effect on the ability of the model to predict bond ratings; and to discover if there exists a separate convertible bond effect.

The empirical studies have relied almost exclusively on the use of financial ratios in predicting bond ratings. In 1984 Gentry, Newbold and Whitford [16, 17, 18] used cash based funds flow components in logit, probit and MDA models to predict bankruptcy and gain unique insight into the bankruptcy process. The dynamic capabilities of the model makes it possible to measure the relative contribution and stability of the cash inflow and outflow components. The information contained in cash based flows is markedly different from the information imbedded in stock based financial ratios. The former model records the total flow of cash throughout the firm and provides diagnostic information for measuring the financial performance of management. Because the components of the model are always the same, it is unnecessary to determine which set of ratios best fit the data. Therefore, always having the same set of cash based components for each study overcomes a basic shortcoming of previous bond rating empirical analysis, when a unique set of ratios was obtained for each study.

A primary objective of this study is to use cash based funds flow components to classify and predict industrial bond ratings for both new offerings and reclassified issues. In Section I we review briefly the main stream findings in the bond rating literature and develop a historical overview of bond market offerings. An explanation of the funds flow model is presented in Section II. The selection of the sample companies that offered new debt or whose bond ratings were changed are presented in section III. Finally, in Section IV the empirical results from the probit models are analyzed and Section V develops the major conclusions of the study.

I. OVERVIEW

Literature

There has been an evolution of statistical models used to predict bond ratings and risk premium. The early studies in the 1950s and 1960s relied on financial ratios and multiple regression analysis, e.g., Fisher [13], Pogue and Soldofsky [40], Horrigan [22] and West [46]. Since the 1970s linear or quadratic MDA models combined with financial ratios were used to predict bond ratings, e.g., Pinches and Mingo [36], Altman and Katz [3], Bhandari, Soldofsky and Boe [8], Belkaoui [6, 7], and Peavy and Edgar [30, 31]. In the late 1970s and early 1980s probit was used by Kaplan and Urwitz [24] and Wingler and Watts [49] to predict bond ratings.

Although each study used different sample companies, time periods and ratios, the accuracy of the models in classifying new bond ratings ranged from approximately 65 percent to 75 percent for a broad based sample of industrial companies, i.e., Pinches and Mingo [37], Kaplan

and Urwitz [24], Belkaoui [6, 7] and 85 percent accuracy for Pogue and Soldofsky [40]. For a sample of new public utility offerings, Altman and Katz [3] achieved a 91 percent classification accuracy, while Bhandari, Soldofsky and Boe [8] and Wingler and Watts [49] achieved a 65 to 75 percent classification accuracy. For reclassified issues the measurement of success ranged from 66 percent for Horrigan [22] to 69.8 percent for Bhandari, Soldofsky and Boe [8].

The time period used for collecting the financial ratio information to build the models ranged from 1961-1964 for Horrigan [22] and 1961-1966 for Pogue and Soldofsky [40] to 1981 for Belkaoui [7]. Several of the studies used data from the period 1967-1978, e.g., Pinches and Mingo (1967-1968), Kaplan and Urwitz (1970-1974), Bhandari, Soldofsky and Boe (1972-1976), Pinches, Singleton and Jahankani (1975), Wingler and Watts (1969-1976) and Belkaoui (1978). Belkaoui [7] used data for the period 1980 and 1981.

Using the coefficients from the original model to predict ratings in a different time period is the acid test of a model's prediction ability. Studies that used this approach were Horrigan [22], Pinches and Mingo [37] and Belkaoui [7]. The success rate for predicting bond ratings ranged from 56 percent to 64 percent for the three previously mentioned studies. The reason the predictive results are lower than the classification model has been questioned by each of the authors. The instability of the bond ratings between the classification and prediction periods has been raised as a possible reason that predictive results are less accurate than the classification results.

Stability of Bond Offerings

Models for predicting bond ratings in year t are built on financial information acquired from companies rated in year t-1. Statistical models assume the distribution of the bond ratings remain relatively stable between year t-1 and t. Panel A in Table 1 shows the deterioration in credit ratings for outstanding straight publicly offered corporate bonds between 1973 and 1983. In 1973 22.9 percent of the outstanding debt was rated AAA, while in 1983 only 10.6 percent was rated AAA. AA rated bonds increased from 28.5 of the total in 1973 to 31.6 percent in 1983. The A rated debt declined from 28.9 percent of the total in 1973 to 25.6 percent in 1983. The proportion of BBB rated bonds increased from 10.5 percent of total debt outstanding to 17.7 percent between 1973 and 1983 and other (high yield) debt increased from 9.3 percent of the total to 14.5 percent. Panel B in Table 1 shows that the distribution of industrial bonds shifted to lower ratings between 1981 and 1984. In 1981 26.5 percent of the industrial bonds outstanding were rated BBB or lower while in 1984 41 percent were rated BBB or lower.

A second test of the stability of industrial bond ratings is the distribution of new offerings among Moody's six rating classes. For each year during the period 1965-1984 the number of new industrial fixed income bonds rated in each risk category are presented in Table 2 and the number of new convertible bond offerings are in Table 3. It is apparent that the absolute number and relative proportions of new issues in each risk class varied widely from year to year. In 1978 Table 2 shows there was a significant increase in the number of Ba and

B rated nonconvertible bonds. Prior to 1978 there were very few issues in the Ba and B rating classes. Also, Table 3 shows the high proportion of convertible bonds that were rated Ba and B during the period 1965 to 1972. During the period 1972-1979 there were very few convertible bonds offered in the market. However, in 1980 the demand for convertible bonds increased sharply, and it continued through 1984.

Many of the previous bond rating studies used new bond offering information from the period 1965 to 1978 when the preponderance of Ba and B rated issues were convertible subordinated bonds. During this period rating agencies usually rated subordinated convertible issues one class lower than a straight fixed income bond. That is, a company with outstanding debt rated Baa by Moody's would more than likely have a new subordinated convertible rated Ba. Thus for the companies included in previous studies that offered subordinated convertibles, it is likely they were underrated by one risk class. A portion of the misclassification of A, Baa, and Ba bond ratings in previous studies may have been related to the underrating of the companies that offered subordinated convertible bonds.

The size of the market for high yield bonds has grown rapidly since 1978. The significance of the investment opportunities in the low rated bonds has been recognized by Blume and Keim [9], Fitzpatrick and Severiens [14], Drexel Burnham Lambert [11], Sorenson [44], Altman and Nanmacher [2]. Table 4 presents the trend of new high yield issues for the period 1977 to 1984. New high yield issues raised $0.55 billion in 1977 and reached a high of $14.2 billion in 1984, which represents approximately 25 percent ($14.2/$56.2) of new public

straight bond issues in 1984. In the empirical analysis the straight Ba and B rated bonds are analyzed separately from the new convertible bonds.

The instability of the demand for debt capital by industry sector is frequently cited as a reason the prediction of bond ratings are substantially lower than the classification test results. To observe the stability of demand for new debt among the several industries, over time, Table 5 presents at twenty year history of gross proceeds from primary nonconvertible bond offerings by major industry sector. It is apparent that there is only limited stability in the new debt offerings of an industry. For example in 1965, the manufacturing sector raised $4.2 billion which represented 36 percent of total debt offerings. Since 1980 the manufacturing sector composed less than 25 percent of the total. In contrast, between 1965 and 1972 finance and real estate combined represented between 6 and 11 percent of the total, but by 1984 it represented over 50 percent of total debt offerings.

The preceding overview shows there are a variety of reasons that prediction model results underperform the classification model performance results. The overview provides a base for interpreting the classification and prediction results for the forthcoming analysis.

II. THE MODEL

Rationale

In an accounting context, cash inflows equal cash outflows. The level and speed of the cash flows reflect managements' operating, investment and financing decisions. The distributions of the components generating cash inflows and outflows are signals that reflect

the resource allocation decisions of management. The trends of the changes in cash inflow and outflow components provide measures for discriminating between bond rating classes.

Components

The model we use to identify funds flow measures was developed by Erich Helfert [21]. After extensive use of Helfert's model, we redesigned it to have eight major components [16]. The eight net funds flow components are operations (NOFF), working capital (NWCFF), financial (NFFF), fixed coverage expenses, i.e., interest and lease payments (FCE), capital expenditures (NIFF), dividends (DIV), other asset and liability flows (NOTHER) and the change in cash and marketable securities (CC). The interrelationship among the components is quite complex. Excepting changes in cash and marketable securities, a source (S) would be a positive number and a use (U) would be negative. As a first cut, the following equation presents a formulation of the cash based funds flow model and the most likely source/use classification of each component for a financially healthy firm.

NOFF	+	NWCFF	+	NFFF	+	FCE	+	NIFF	+	DIV	+	NOTHER	-	CC	=	0
+		0-		+		-		-		-		-		+		
(S)		(U)		(S)		(U)		(U)		(U)		(U)		(U)		

The accounting convention underlying the funds statement results in total net inflow of funds (TNIF) being equal to the absolute value of total net outflow of funds (TNOF). We have simplified the notation by substituting the expression total net cash flow (TNCF) for TNIF and

TNOF. Thus by dividing each funds flow component by TNCF, one can determine the percentage each component contributes to the total.

Research Study

Our analysis uses 12 funds flow measures to classify failed and nonfailed companies. We substituted the five working capital components for the single net working capital component, omitted the component CC/TNF to avoid a statistical problem of overidentification and added a size measure, total net flows as a percentage of total assets (TNCF/TA) [17, 18].

II. SAMPLE SELECTION

Moody's bond ratings were acquired for all industrial bond offerings for 1983 and 1984. There were 127 new issues in 1983 and 155 in 1984. Additionally all industrial bonds that were reclassified in either 1983 or 1984 were also included in the sample. Next we determined if two years of complete company financial information was available on the Compustat industrial tapes in order to compute funds flow components and financial ratios. There was complete financial information on 64 new issues in 1983 and 61 new issues in 1984 as shown in Table 6. Complete financial data was available for 37 issues that were reclassified in 1983 and complete data for 44 issues reclassified in 1984. Table 7 presents these data.

The sample data are presented in five classes of Moody's ratings that range from Aa to B in Tables 6 and 7. Because there were only six Aaa rated bonds with available data for 1983 and 1984, the Aaa bonds were not included in the sample. The distribution of the ratings in

1984 are markedly different from the 1983 ratings. That is 65.6 percent of 1984 sample bonds are rated A or higher, while 51.6 percent of the 1983 sample bonds are rated A or higher. Additionally, in 1984 13 percent were rated Baa compared to 25 percent Baa ratings in 1983.

IV. ANALYSIS

An n-chotomous multivariate probit model developed by McKelvey and Zavonis [27], and used by Kaplan and Urwitz [24], was utilized with the thirteen funds flow components to model the 1983 Moody's bond classification process. The coefficients from the model were used to predict the 1984 bond ratings. One model classified the new bond issues and a separate model focused on the bonds that were reclassified. Furthermore, the six measures from Pinches and Mingo (PM) [37] were adopted to determine the contribution of financial ratios in classifying and predicting bond ratings in 1983 and 1984. The six measures were: (1) subordination, (2) amount of the issue in dollars, (3) debt ratio, (4) cumulative years that dividends were paid, (5) net income/total asset (NI/TA), and (6) net income/ interest.[3] We adopted the PM variables rather than try to select sample dependent ratios for this comparative segment of the paper.

The empirical analysis will classify the bond ratings with three separate sets of financial information. One based on cash flow information--the thirteen funds flow components; another based on static financial information--PM's six measures; and combining the funds flow components with the PM measures. By using three separate sets of financial information, it is possible to determine the relative contribution of each one in the predictions of 1984 bond ratings. In

determining if the convertible and subordinate issues were significant in classifying and predicting the bond ratings, a dummy variable was included for each variable. A comparison of the ratings of the outstanding regular debt to the ratings of new convertibles revealed that in only one company was the regular bond rating close to one rating higher than the convertible issue. That was the Singer Company where the regular debt was rated Ba2 and the convertible was rated B1. In 1983 there were two issues where the regular bond and the convertible issue were rated the same and in 1984 three issues had the same rating for the regular debt and the convertible issue. In the remaining cases, one in 1983 and five in 1984 the rating difference was only one subclass lower, e.g., Baal for the regular debt and Baa2 for the convertible. Thus the concern of the downrating of the convertible bonds is prior empirical studies is not an issue in this study. The convertible dummy was excluded from the analysis, but the subordination dummy remains.

Classification Results

When using the funds flow components to classify the 1983 new bond issues, Table 8 shows approximately 59 percent (38/64) of the bond ratings were classified correctly. PM's ratios correctly classifyed 64 percent (41/64) of the new issues and when the two were combined they correctly classify 72 percent (46/64) of the new issues. The funds flow components and PM's ratios correctly classified 59 percent (22/37) of the bonds that were reclassified in 1983. When these two measures were combined, they correctly classified 65 percent (24/37) of the revised issues. When the revised and new issues were combined, Table 8

shows the classification results were sightly lower than when the two issues were analyzed separately. The classification results for the new issues are similar to but slightly lower than previous studies.

The probit coefficients generated by the three sets of financial information are presented in Table 9. When the funds flow components were used to classify the new bond issues, none were statistically significant. However, three of PMs static measures were significant for the same test. They were the total dollar amount of the bond issue, cumulative years in which dividends had been paid, and rate of return on assets. When the two sets of information are combined only the dollar amount of the issue and the cumulative years of dividends were significant in classifying new bond issues.

When classifying the bonds that were revised in 1983 Table 9 shows four of the funds flow components were statistically significant. These flow components were inventories, financing, fixed coverage expenditures and dividends. An interpretation of each of the significant components provides insight to the bond rating process. The higher the percent of total outflow going to inventories the higher the bond rating. The higher flow to inventories signals demand for the products and continued growth. The lower the percentages of inflows from long-term financing sources, the lower the financing risk and the higher the bond rating. The higher the percentage of outflow going to fixed coverage the lower the rating. Finally, the higher the percentage of total outflow going to dividends, the higher the bond rating. The dividends are the theoretical base for value, thus the higher the percentage of total outflow going to dividends the higher the potential value of the firm.

The probit model identifies two ratios--the debt ratio and the rate of return on total assets--as being significant in classifying the revised bond ratings. When the financial information is combined the subordination variable was significant, as well as the inventory flow component and the financing component.

Prediction Results

The probit model coefficients were used to predict the 1984 results. Table 8 shows the 1983 funds flow components correctly predicted only 47.5 percent (28/61) of the 1984 new bond ratings, while the ratios predicted 57.4 percent (35/61) of the new issues ratings. When the ratios and flows were combined, 47.5 percent (28/61) of the new issue ratings in 1984 were correctly predicted. The prediction results of the reclassified issues were less successful than the new issues. These data are reported in Table 8.

At first blush the prediction results are disappointing, but a close inspection of the probit rating predictions shows that a high percentage of the misclassified/mispredicted bond ratings are extremely close to the actual ratings. The probit model provides the probability of the bond being classified in each of the five categories. Generally the probabilities fall in three classes, e.g., Aa--31%, A--52% and Baa--17%. In the example the predicted bond rating would be an A. If the actual rating was an A, the model correctly predicted the rating. If however, the actual rating was a Aa the bond rating would be mispredicted, but the predicted A rating is closer to the Aa than the Baa rating. By analyzing the probability distributions for each rating it is possible to determine (1) the number of correct classifications for

the 1983 bond ratings and the correct predictions for the 1984 bond ratings; (2) the number of 1983 classifications and 1984 predictions that are on the correct side of the probability distribution of the ratings. We label the last group as close.

Using the 1983 bond ratings and the funds flow components the probit model correctly classified 38 new issues and is close on 20 of the 64 new offerings. When the two classifications are combined, the model correctly classifies or is close in classifying 90.6 percent of the new issues. These results are shown in Table 10. For the 1984 new bond ratings; 29 of the predictions are correct and 20 of the 61 new bond ratings are close for a total of approximately 80 percent correct/close predictions. For the combined financial information the 1983 new bond rating classification results are 92 percent for the correct/close measure compared to ony 72 percent being correct. The correct/close prediction percentage is 77 percent compared to only 48 percent being correct. All of these results are found in Table 10.

The classification/prediction results for the reclassified bond issues are also markedly different from the model that measured only the correct results. The reclassified issues are subdivided into upgraded and downgraded issues. The funds flow components classify 86 percent of the upgrades as correct/close, while 96 percent of the downgrades are either correct or close. The results are presented in Table 11. The ratios have similar classification results for the upgraded issues and 100 percent for the downgraded issues. The combined financial information have correct/close classification results identical to the funds flow components.

The correct/close 1984 prediction results are 77 percent for the funds flow components for both upgraded and downgraded issues, while the ratio results are 68 percent for the upgrades and 82 percent for the downgrades. When the ratio and funds flow components are combined, the correct/close results are 73 percent for the upgrades and only 50 percent for the downgraded issues. Table 11 presents these results.

Log Likelihood Test--New Issues

The change in the log likelihood statistic from the probit analysis serves as the basis for measuring the significance of the contribution of funds flow components vis-a-vis financial ratios in classifying bond ratings. The first test uses only the intercept to classify the sample companies. The objective of initially using only the intercept to classify the sample companies is to establish a standard for comparing the change in the likelihood statistic when ratios and fund flow components are added separately. The log of the likelihood function statistic for test 1, intercept only, is -141.83 and is reported in Table 12.

The second test adds six financial ratios to the probit analysis. When the six ratios for test 2 are added, the likelihood statistic drops to -54.00 as reported in Table 12. A Chi Square test of the change in the likelihood statistic from -141.83 to -54.00 is significant at the .01 level of confidence.

The third test adds the thirteen funds flow components to the intercept in classifying the sample companies. The log of the likelihood statistic is -58.17 compared to -141.83 with the intercept only. The Chi Square statistic shows the addition of the thirteen funds flow

components make a significant contribution in classifying the sample companies at the .01 level of confidence. The implication of tests 2 and 3 are that separately financial ratios and funds flow components contribute information that significantly improves the classification of the bond ratings of new issues.

Test 4 combines thirteen funds flow components with the six financial ratios in the probit analysis. When the ratios are combined with the thirteen funds flow measures in the probit analysis, the log of the likelihood statistic is -46.32, as shown in Table 12. In measuring the marginal contribution of adding six ratios to the thirteen funds flow components in test 4, the Chi Square results show the change in the likelihood statistic from -54.00 to -46.32 is not statistically significant at the 5 percent level. When the thirteen funds flow components are combined with six ratios, the marginal contribution to the likelihood statistic is not statistically significant at -58.17 to -46.32. Thus, combing the funds flows and ratios does not provide additional statistically significant discriminating information in classifying bond ratings.

Log Likelihood Tests--Reclassified Issues

The same set of tests are completed for the reclassified bond issues. The log likelihood results are reported in Table 12. For test 6 when the ratios are added to the intercept, the Chi Square test of the change in the likelihood statistic from -77.51 to -39.43 is significant at the .01 level of confidence.

The seventh test adds the thirteen funds flow components to the intercept in classifying the companies. The log of the likelihood

statistic is -34.20 compared to -77.51 with the intercept only. The Chi Square statistic shows the addition of the funds flow component makes a significant contribution in classifying the 37 bond issues whose ratings were reclassified. When the two sets of financial information are combined, the marginal contribution of adding the ratios to the funds flow components or vice versa does not provide additional, statistically significant information for classifying the ratings of the reclassified bond issues. In summary, financial ratios and funds flow components contribute information separately that significantly improves the classification of the reclassified bond ratings, but jointly they do not improve the classification ability of the probit model.

V. CONCLUSIONS

The log likelihood tests showed both ratios and funds flow components contributed information that significantly improved the ability of the n-chotomous multivariate probit model to classify new and revised bond ratings. The prediction results of the ratios and funds flow measures were moderately lower than results from previous studies. However, when the correct/close prediction results were determined, the model was found to be substantially better than its original performance indicated. Secondly, the ratios provided slightly higher prediction results than the funds flow components.

The predictive success of the model was lower than in previous studies for several reasons. First, there was a substantial increase in the noninvestment grade bond issues in 1983 and 1984 in comparison to previous studies that used bond ratings for the 1967-1978 period.

The shift to higher risk issues in the 1980s results in higher variance of the financial information which makes the modeling process more difficult. This higher instability of the financial information results in greater difficulty in predicting bond ratings.

Second, the distribution of the new bond offerings in 1984 were markedly different from the 1983 new issues. The 1984 offerings were more concentrated in the higher rated issues than the 1983 new issues. Thus the probit classification model was based on 1983 financial information of companies that had higher financial and business risk than the companies whose 1984 bond ratings were being predicted. This phenomenon is not new, but tends to lower the predictive success of the model.

The funds flow components provided unique insight concerning the rating prediction of reclassified bond issues. The n probit model indicated bond ratings were higher when the percentage outflow of funds to inventories and dividends was high, the percentage outflow of funds to fixed coverage expenditures was low, and the percentage inflow of funds from long-term, external financing sources was small.

This study illustrates the complexity of predicting bond ratings and how the information in the system has changed dramatically since 1978. The shift in the distribution of new bond offerings to riskier issues has increased the difficulty in determining bond ratings. Adding the refinement of 1, 2 or 3 to each of the ratings has increased the nuances in the complexity of the rating process. Finally, it is apparent that the complexity of the rating process limits the predictive accuracy of financial information based models.

Footnotes

[1]The authors express their appreciation to Hei Wai Lee, a graduate student at the University of Illinois, for his computer expertise and assistance and to Professor Michael Dugan for his programming advice.

[2]Kaplan and Urwitz [24] and Belkaoui [7] also provide an extensive review of the literature.

[3]The methodology used by PM [37, p. 6] in determining each variable was repeated in this study.

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TABLE 1

Credit Rating of the Outstanding Secondary Market
In Straight Publicly Offered Corporate Bonds

Panel A[1]
(in percent)

Credit Rating	1983	1978	1973
AAA	10.6	23.4	22.9
AA	31.6	27.6	28.5
A	25.6	33.2	28.9
BBB	17.7	10.7	10.5
Other	14.5	5.1	9.3

Panel B[2]
Credit Rating for Outstanding Industrial Bonds
1981-1984
(in percent)

Credit Rating	1984	1983	1982	1981
AAA	5.9	8.5	9.3	10.2
AA	27.2	26.8	27.4	28.0
A	25.9	26.1	32.2	35.3
BBB	14.6	15.5	10.4	5.9
Other	26.4	23.0	19.6	20.6

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[1] James McKeon. "A Decade of Change, 1973-1983: Heavy Retirements Help Restructure Corporate Bond Market Anatomy." Memorandum to Portfolio Managers, Salomon Brothers, May 1, 1984, p. 4.

[2] James McKeon and Nancy Kimelman. "The Anatomy of the Secondary Market in Corporate Bonds, Year-End 1983 Update." Memorandum to Portfolio Managers, Salomon Brothers, May 1, 1984, p. 3.

TABLE 2

Number of New Industrial Fixed Income Issues
Rated By Moody's, 1965-1984[1]

Fixed Industrial Bonds

	1965	1966	1967	1968	1969	1970	1971
Aaa	-	3	5	3	6	4	7
Aa	1	5	12	5	11	11	11
A	8	10	29	9	6	47	39
Baa	7	8	14	6	3	17	21
Ba	2	-	3	6	7	5	5
B	3	2	-	9	1	-	3
Caa	-	-	-	-	-	-	-
Total	21	28	63	38	34	84	86

	1972	1973	1974	1975	1976	1977	1978
Aaa	2	-	7	10	2	3	2
Aa	4	4	17	22	11	7	4
A	9	9	30	54	22	6	8
Baa	13	4	1	7	4	9	5
Ba	1	4	1	1	-	2	9
B	2	1	-	-	-	9	29
Caa	-	-	-	-	-	-	-
Total	31	22	56	94	39	36	57

	1979	1980	1981	1982	1983	1984
Aaa	5	5	7	3	3	6
Aa	14	19	13	18	14	15
A	14	47	29	51	18	34
Baa	5	12	4	11	17	12
Ba	7	7	5	7	4	16
B	23	27	19	19	31	50
Caa	-	-	-	-	1	1
Total	68	117	77	109	88	134

[1] Moody's Bond Surveys, 1965-1974.

TABLE 3

Number of New Industrial Convertible Issues, Rated by Moody's, 1965-1984[1]

Convertible Bond Issues

	1965	1966	1967	1968	1969	1970	1971
Aaa	-	-	-	-	-	-	-
Aa	-	-	-	-	1	-	1
A	-	-	1	1	-	1	-
Baa	-	2	11	7	5	3	4
Ba	14	13	45	25	34	9	21
B	16	14	42	42	33	11	9
Caa	-	-	-	-	-	-	-
Total	30	29	99	75	73	24	35

	1972	1973	1974	1975	1976	1977	1978
Aaa	-	-	-	-	-	-	-
Aa	-	-	-	-	-	-	-
A	1	-	1	-	2	1	-
Baa	2	-	1	8	2	-	-
Ba	10	1	2	-	2	-	4
B	6	1	-	-	3	-	2
Caa	-	-	-	-	1	-	-
Total	21	2	4	8	10	1	6

	1979	1980	1981	1982	1983	1984
Aaa	-	-	1	1	-	1
Aa	-	-	1	1	-	-
A	1	1	5	1	5	4
Baa	1	6	5	5	7	8
Ba	2	17	14	7	9	3
B	1	13	21	10	18	5
Caa	-	-	-	-	-	-
Total	5	37	49	25	39	21

[1]Moody's Bond Surveys, 1965-1984.

TABLE 4

High Yield Bond Issues
1977-1984[1]
(in $billion)

	New Issues	Exchange Offerings	Utilities
1977	$ .55	.50	.01
1978	1.45	.68	.00
1979	1.30	.30	.09
1980	1.27	.68	.11
1981	1.30	.32	.04
1982	2.51	.53	.14
1983	7.52	.49	.48
1984	14.21	.70	.87
Total	30.19	4.20	1.74

[1]Drexel Burnham Lambert, "The Case for High Yield Bonds, March 1985, p. 3.

TABLE 5

Gross Proceeds from Primary Non-Convertible Bond Offerings, For Major Industries[1] 1965-1981 and Public Offerings 1981-1984[2] (in billion or dollars)

Year	Business	Manufacturing $	Manufacturing % of Annual Total	Electric, Gas and Water $	Electric, Gas and Water % of Annual Total	Communications $	Communications % of Annual Total	Financial and Real Estate $	Financial and Real Estate % of Annual Total
1965	11.6	4.2	36	2.3	20	.8	.7	1.3	11
1966	13.1	4.9	37	3.0	23	1.8	14	1.1	8
1967	16.8	7.2	43	4.2	25	1.7	10	.8	10
1968	13.8	4.3	31	4.3	31	1.6	12	.9	6
1969	13.7	2.7	20	5.4	39	1.9	14	.9	6
1970	26.5	8.4	32	7.9	30	4.9	18	1.9	7
1971	26.4	8.1	31	7.5	28	4.2	16	3.0	11
1972	23.5	4.1	17	6.3	27	3.6	15	5.1	22
1973	20.1	4.1	20	5.6	28	3.5	17	4.0	20
1974	31.0	9.6	31	8.9	29	3.7	12	4.8	15
1975	41.5	6.2	39	9.6	23	3.4	8	5.0	12
1976	41.2	2.5	30	8.3	20	2.8	7	7.2	17
1977	41.4	1.9	29	7.6	18	3.1	7	9.6	23
1978	37.0	9.5	26	7.0	19	3.3	9	7.4	20
1979	39.9	9.6	24	8.3	21	4.2	10	8.7	22
1980	51.6	5.0	29	9.4	18	6.7	13	10.9	21
1981	41.3	0.2	25	8.8	21	4.2	10	10.5	25
1982	41.7	9.7	23	9.1	22	1.1	3	14.4	34
1983	43.4	6.8	16	6.8	16	3.3	8	19.3	44
1984	56.2	9.7	17	5.6	10	1.4	2	28.8	51

[1]The industries not included are Extractive, Transportation, Sales and Consumer Finance, Commercial and Other. The percentages do not sum to 100 percent because these industries provide the balancing entry.

[2]Source: SEC Monthly Statistical Review, U.S. Securities and Exchange Commission, 1976, 1981, 1985.

TABLE 6

Number of New Regular and Convertible Issues,
Either Subordinated or Nonsubordinated,
by Rating Class for 1983 and 1984

1983

	Regular		Convertible			% of
	Nonsub.	Sub.	Nonsub.	Sub.	Total	Total
AA	14	-	-	-	14	21.9
A	18	-	1	-	19	29.7
Baa	11	2	-	3	16	25.0
Ba	-	2	-	5	7	10.9
B	-	2	-	6	8	12.5
	43	6	1	14	64	100.0

1984

	Straight		Convertible			% of
	Nonsub.	Sub.	Nonsub.	Sub.	Total	Total
AA	15	-	-	-	15	24.6
A	22	-	1	2	25	41.0
Baa	7	-	-	1	8	13.1
Ba	3	2	-	-	5	8.2
B	1	6	-	1	8	13.1
	48	8	1	4	61	100.0

TABLE 7

Number of New Regular and Convertible Issues,
Either Subordinated or Nonsubordinated,
by Moody's Rating Class for 1983 and 1984

1983

Rating Class	Regular		Convertible		Total	% of Total
	Nonsub.	Sub.	Nonsub.	Sub.		
AA	5	-	-	-	5	13.5
A	12	-	-	-	12	32.5
Baa	10	2	-	1	13	35.1
Ba	3	1	-	-	4	10.8
B	-	1	1	1	3	8.1
	30	4	1	2	37	100.0

1984

	Regular		Convertible		Total	% of Total
	Nonsub.	Sub.	Nonsub.	Sub.		
AA	5	-	-	-	5	11.4
A	12	-	-	1	13	29.5
Baa	11	2	-	3	16	36.4
Ba	2	3	-	2	7	15.9
B	-	2	-	1	3	6.8
	30	7	-	7	44	100.0

TABLE 8

The Percentage of the Bond Ratings
Classified and Predicted Correctly

Classification of 1983 Issues

	Revised Issues	New Issues	Revised and New Issues Combined
Sample Size (N)	37	64	101
Ratios	59.46	64.06	59.41
Funds Flow Components	59.46	59.38	56.44
Combination of Ratios and Funds Flow	64.87	71.88	60.40

Prediction of 1984 Ratings

Sample Size (N)	44	61	105
Ratios	36.36	57.38	49.52
Funds Flow Components	29.54	47.54	36.19
Both Ratios and Funds Flows	22.73	49.54	39.05

TABLE 9

Probit Coefficients With a Dummy for Subordination and No Dummy for Convertible Bonds

	Ratios			Funds Flows			Ratios and Funds Flows		
	Revised	New	Combined	Revised	New	Combined	Revised	New	Combined
Constant	1.50	6.35*	2.55**	-1.82	1.86	1.15	-5.87	6.18	1.35
Subordination	1.05	5.74	2.11*	1.30	6.53	2.49**	2.02**	6.33	2.35**
Dollar Amount of Issue		-1.44**	-	-			-	-1.41**	-
Ratios									
Debt Ratio	6.28**	-.03	2.15				7.01	4.42	3.83
Cumulative Years of Dividends	.84	-1.40**	-1.25**				.75	-1.71**	-1.23**
NI/TA	-.55**	-.69**	-.64**				-.99	.80	-.53
NI/INT	-.30	-.65	-.12				1.61	1.89	1.67
Funds Flow									
Flow/TA				2.28	-3.82	-2.31	2.71	-7.49	-3.50
Operating				3.07	-.98	.47	5.41	-2.33	.66
Receivables				3.20	.78	1.98	3.45	-.11	.87
Inventories				7.22**	1.11	2.70**	7.06**	1.90	1.97
Other C.A.				.70	-.85	1.34	1.88	-.01	.97
Payables				1.81	.32	.59	.38	-1.19	-.76
S-T Debt				2.30	1.07	.10	2.25	-1.74	-.78
Other CL				4.96	.95	1.99	5.22	-.29	.58
Other A&L				3.60	-.65	.89	4.97	-1.84	.14
Financing				4.03**	.37	1.83**	5.75**	.10	1.35
Fixed Coverage Exp.				-11.77**	-4.09	-4.16**	-7.16	-7.36	-3.58
Interest				.19	-.67	.16	2.66	-1.24	-.03
Dividends				13.72**	6.80	7.87**	10.00	3.70	5.13

**Significant at .05 level of confidence

TABLE 10

Classification and Prediction Results of
New Offerings, 1983 and 1984

	Number Correct	Incorrect, but Close	Total	% of Total Correct or Close
Ratios				
1983	41	18	64	92.2
1984	35	18	61	86.9
Funds Flow				
1983	38	20	64	90.6
1984	29	20	61	80.3
Combined				
1983	46	13	64	92.2
1984	29	18	61	77.0

TABLE 11

Classification and Prediction Results of
Rating Upgrades and Downgrades, 1983 and 1984

	Number of Upgrades--				Number of Downgrades--			
	Correct	Close	Total	% of Total Correct or Close	Correct	Close	Total	% of Total Correct or Close
Ratios								
1983	9	3	14	85.7	13	10	23	100.0
1984	8	7	22	68.2	7	11	22	81.8
Funds Flows								
1983	9	3	14	85.7	13	9	23	95.6
1984	9	8	22	77.3	5	12	22	77.3
Combined								
1983	8	12	14	85.7	16	6	23	95.6
1984	4	12	22	72.7	6	5	22	50.0

TABLE 12

LOG LIKELIHOOD RESULTS

Test Number	NEW Issues Tests	Log of Likelihood Functions
1	Intercept Only	-141.83
2	Six Financial Ratios	-54.00
3	Thirteen Fund Flow Components	-58.17
4	Combined Ratios and Flows	-46.32
	RECLASSIFIED Issues	
5	Intercept Only	-77.51
6	Six Financial Ratios	-39.43
7	Thirteen Funds Flow Components	-34.20
8	Combined Ratios and Flows	-32.23